MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PTM0145 –TRIGONOMETRY

(Foundation in Information Technology / Foundation in Life Sciences)

30 MAY 2016
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **TWO** printed pages excluding the front cover and the appendix. Distribution of marks for each question is given.
2. Answer **any FIVE** questions.
3. Write your answers in the Answer Booklet.
4. All necessary workings **MUST** be shown.

Instruction: Answer **any FIVE** questions.

Question 1 [10 marks]

a. Solve the equation $5x^2+1=2x$ in the complex number system. Write the answer in the standard form $a + bi$. (3 marks)

b. Write the expression $i^3(2-3i)^2$ in the standard form $a + bi$. (3 marks)

c. Given $z = 2 - i$.
   i. Find the polar form for z. (3 marks)
   ii. Use the De Moivres Theorem to find z^4. (1 mark)

Question 2 [10 marks]

a. A line, L_1, passes through point A(2, 0) and point B(4,6).
   i. Find the slope of the line L_1. (1 mark)
   ii. Identify the midpoint of AB. (1 mark)
   iii. Find the equation of the line passing through the midpoint of AB and perpendicular to the line L_1. (2 marks)

b. Find the centre, foci and vertices of the ellipse: $2x^2+3y^2-8x+6y+5=0$. (6 marks)

Question 3 [10 marks]

a. Given $P=\begin{bmatrix}2 & 3\\ -1 & 4\end{bmatrix}$, $Q=\begin{bmatrix}7 & 2 & -3\\ -4 & 2 & 9\end{bmatrix}$ and $R=\begin{bmatrix}0 & 6\\ -2 & 4\end{bmatrix}$. Find
   i. $P^2+\frac{1}{2}R$. (3 marks)
   ii. Q^TQ. (3 marks)

b. Given a matrix $A=\begin{bmatrix}1 & -1 & 1\\ 0 & -2 & 1\\ -2 & -3 & 0\end{bmatrix}$ and its determinant, $|A|=1$. Find the inverse of matrix A. (4 marks)

Continued...

Question 4 [10 marks]

a. Solve the equation, $3\tan^3 x = \tan x$ for $0° \le x \le 360°$ (5 marks)

b. Find the exact value of $\cos\theta$ and $\tan 2\theta$ given $\sin\theta = -\frac{1}{3}$ and θ is in quadrant 4. Do not use a calculator. (5 marks)

Question 5 [10 marks]

a. Verify the identity: $\frac{1+\sin x}{1-\sin x} = \frac{1}{(\sec x - \tan x)^2}$ (5 marks)

b. A, B, C are vertices of a triangle. Solve the triangle if $AB = 9$ cm, $BC = 8$ cm, and $\angle BAC = 55°$. (5 marks)

Question 6 [10 marks]

a. Sketch the graph of $y = \sin x$ and $y = -2\sin 2x$ for $0 \le x \le 2\pi$ on the same xy - plane. (4 marks)

b. Determine the amplitude, period and phase shift of the function:

$$y = 2\cos(2x - \pi) \qquad \text{for } 0 \le x \le 2\pi$$

Graph the above function. Identify the points on the x-axis and the y-axis. (6 marks)

End of Paper

APPENDIX 1 **FORMULAS**

$$\sec A = \frac{1}{\cos A} \qquad \csc A = \frac{1}{\sin A} \qquad \cot A = \frac{1}{\tan A} = \frac{\cos A}{\sin A}$$

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B \qquad \cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \cos^2 A - \sin^2 A$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B \quad \ldots \quad \sin 2A = 2 \sin A \cos A$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \quad \ldots\ldots \quad \tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$$

$$2 \cos A \cos B = \cos(A + B) + \cos(A - B)$$

$$2 \sin A \sin B = \cos(A - B) - \cos(A + B)$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2} \quad \ldots\ldots \quad \sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2} \qquad \cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin^2 \frac{A}{2} = \frac{1 - \cos A}{2} \qquad \cos^2 \frac{A}{2} = \frac{1 + \cos A}{2} \qquad \tan^2 \frac{A}{2} = \frac{1 - \cos A}{1 + \cos A}$$

$$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}} \qquad \cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}} \qquad \tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

$$\frac{A}{\sin A} = \frac{B}{\sin B} = \frac{C}{\sin C} \qquad c^2 = a^2 + b^2 - 2ab \cos C$$